

CLAIMS

1 1. A biological retrieval and processing system comprising:
2 a repository of biological specimens;
3 a robot for retrieving predetermined specimens from said repository and delivering said
4 retrieved specimens to a first staging area and for returning each specimen from
5 said first staging area back to said repository;
6 a feeder adapted to retrieve said specimens from said first staging area and deliver each
7 retrieved specimen to a second staging area; and
8 a punch head operatively associated with said feeder adapted to remove a sample from
9 a substrate of each retrieval specimen and deliver each said sample to a
10 predetermined position at the third staging area.

1 2. The system of claim 1 wherein said feeder is adapted to return each punched
2 specimen to said first staging area.

1 3. The system of claim 2 wherein each biological specimen of said repository is
2 capable of providing a plurality of samples.

1 4. The system of claim 2 wherein said robot includes a reader capable of identifying
2 which specimens to retrieve from said repository.

1 5. The system of claim 4 wherein said reader is a bar code reader.

- 1 6. The system of claim 1 wherein the biological specimen is blood.
- 1 7. The system of claim 1 wherein the biological specimen is blood serum.
- 1 8. The system of claim 1 wherein the biological specimen is blood plasma.
- 1 9. The system of claim 1 wherein the biological specimen is blood lymphocytes.
- 1 10. The system of claim 1 wherein the biological specimen is fixed tissue extracts.
- 1 11. The system of claim 1 wherein the biological specimen is unfixed tissue extracts.
- 1 12. The system of claim 1 wherein the biological specimen is buccal scrapes.
- 1 13. The system of claim 3 wherein the biological specimen is purified DNA.
- 1 14. The system of claim 3 wherein the biological specimen is purified RNA.
- 1 15. The system of claim 3 wherein the biological specimen is purified protein.

1 16. A biological retrieval and processing system comprising:
2 a repository of biological specimens;
3 a robot for retrieving predetermined specimens from said repository and delivering said
4 specimens to a first staging area, and for returning said specimens from said first
5 staging area back to the repository;
6 a feeder adapted to select said specimens from said first staging area and selectively
7 remove specific specimens for delivery to a second staging area; and
8 a punch head operatively associated with said feeder adapted to remove a sample from
9 a substrate of each said selectively removed specimens and deliver each said
10 sample to a predetermined position at a third staging area.

1 17. The system of claim 16 wherein said feeder is adapted to return each punched
2 specimen to said first staging area

1 18. The system of claim 17 wherein each biological specimen is capable of providing
2 a plurality of samples.

1 19. A biological retrieval and processing system comprising:
2 a medical database;
3 a repository of biological specimens, each specimen having an identification code and
4 correlated to a medical entry in said medical database;
5 a robot having a reader capable of reading said identification codes and retrieving
6 predetermined specimens from said repository and delivering said retrieved
7 specimens to a first staging area and for returning said specimens back to said
8 repository;
9 a feeder adapted to retrieve said specimens from said first staging area and deliver each
10 retrieved specimen to a second staging area; and
11 a punch head operatively associated with said feeder adapted to remove a sample from
12 a substrate of each retrieved specimen and deliver each said sample to a
13 predetermined position in the third staging area,
14 wherein said feeder returns each punched specimen to said first staging area.

1 20. A method for collecting selected samples from a repository of biological
2 specimens, comprising the steps of:

3 identifying specimens for retrieval from the repository;

4 retrieving the identified specimens from the repository;

5 delivering the specimens retrieved from the repository to a first staging area;

6 removing selected specimens retrieved from the first staging area and delivering each

7 said selected specimen to a second staging area;

8 removing a biological sample from each specimen at the second staging area; and

9 delivering each biological sample removed from a selected specimen at the second

10 staging area to a third staging area for subsequent processing;

1 21. The method according to claim 20 wherein the retrieving step is done robotically.

1 22. The method according to claim 21 wherein the third staging area comprises a
2 multiwell tray providing for the positioning of each sample taken from each specimen into an
3 individual well of said tray and correlatable to the medical records of a particular individual.

1 23. The method according to claim 20 wherein the method further comprises
2 purifying the individual samples retrieved from each specimen collected in the third staging area
3 for further testing.

1 24. The method of claim 20 wherein the method also includes identifying which
2 specimens to retrieve from a medical database.

1 25. The method according to claim 20 wherein the method further comprises
2 purifying and amplifying the individual samples retrieved from each specimen collected in the
3 third strategy area for further testing.

1 26. An apparatus for preparing biological samples from selected specimens
2 comprising:

3 a feeder assembly adapted to remove a selected substrate from a storage container;

4 a punching assembly having a frame and a movable arm supported by said frame and
5 displaceable in an x, y and z axis relative to said frame;

6 a punch head mounted on the movable arm having

7 a tip adapted to punch a pellet from the substrate,

7 a reservoir adapted to retain the pellet, said reservoir adjacent the tip, and

8 an ejector adapted to eject the pellet from the reservoir; and

9 a position controller adapted to move the arm and position the tip over the substrate in

10 a first position and position the tip over a sample container in a second position,

11 said ejector adapted to eject said pellet in said second position.

1 27. The apparatus of claim 26, wherein the punch head also includes a piston having
2 a first end proximate the reservoir and a second end distal the reservoir, and the apparatus further
3 comprises:

4 a rod contacted the second end of the piston; and

5 a solenoid connected to the rod and adapted to actuate the rod.

1 28. The apparatus of claim 26, wherein the substrate comprises a flexible substrate
2 held in a frame.

1 29. The apparatus of claim 28, wherein the flexible substrate comprises FTA paper.

1 30. The apparatus of claim 28, wherein the frame comprises a 35 mm slide frame.

1 31. The apparatus of claim 26, wherein the storage container comprises a plurality of
2 slots, each adapted to hold a substrate.

1 32. The apparatus of claim 26 wherein the feeder assembly is further adapted to return
2 the substrate to an original position in the storage container after the substrate is punched.

1 33. The apparatus of claim 26, wherein the sample container comprises a well in a
2 multiwell tray.

1 34. The apparatus of claim 26, wherein the substrate comprises indexing indicia, said
2 apparatus further comprising a reader adapted to recognize the indexing indicia.

1 35. The apparatus of claim 34, wherein the indexing indicia comprises a bar code, and
2 wherein the reader comprises a bar code reader.

1 36. The apparatus of claim 26 further comprising a slide positioning controller
2 adapted to recognize previously punched areas on the substrate, wherein the position controller
3 is connected to the slide positioning controller and adapted to position the tip over an unpunched
4 area on the substrate in the first position.

1 37. The apparatus of claim 36, wherein the slide positioning controller includes a
2 microprocessor and an imaging device correlated to said microprocessor.

1 38. The apparatus of claim 36 further comprising a database comprising data
2 representative of punched or unpunched areas on a substrate corresponding to a particular
3 indexing indicia, wherein the microprocessor is connected to the database and is adapted to
4 position the tip over an unpunched region on the substrate in the first position.

1 39. An apparatus for preparing biological samples comprising:

2 a punching pad;

3 a feeder for delivery of a specimen, having a substrate, to the punching pad;

4 a punch head having:

5 a tip adapted to punch a pellet from the substrate,

6 a reservoir adapted to retain the pellet, said reservoir adjacent the tip, and

7 means for ejecting the pellet from the reservoir; and

8 a positioning controller to locate the tip over the substrate in a first position and over a
9 sample container in a second position,

10 said ejecting means ejecting said pellet in said second position.

1 40. The apparatus of claim 39 wherein said feeder is adapted to return the specimen
2 to an original position after the substrate is punched.

1 41. The apparatus of claim 39, wherein the substrate comprises a flexible substrate
2 held in a frame.

1 42. The apparatus of claim 39, wherein the specimen comprises indexing indicia, and
2 further comprising means for recognizing said indexing indicia.

1 43. The apparatus of claim 42 further comprising a second positioning controller for
2 identifying a viable punching area on the substrate.

1 44. A method for retrieving biological samples for processing comprising the steps
2 of:

3 robotically removing a first DNA specimen from a specimen holder;

4 automatically positioning the first specimen over a punching pad;

5 punching a pellet from the first specimen with the tip of a punch head and retaining the

6 pellet in a reservoir in the punch head;

7 moving the tip over a sample holder; and

8 depositing the tip in the sample holder.

1 45. The method of claim 44 further comprising:
2 loading the first specimen in the specimen holder after the specimen is punched;
3 removing a second specimen from the specimen holder;
4 positioning the second specimen on the punching pad; and
5 moving the tip over the second specimen.

1 46. The method of claim 44, wherein the specimen includes a flexible substrate held
2 in a frame.

1 47. The method of claim 44, wherein the specimen includes indexing indicia.

1 48. The method of claim 44 wherein after the positioning step, the method also
2 includes:
3 identifying a viable punching area on the specimen by means of a microprocessor; and
4 automatically positioning the tip over the viable punching area.